Orthorexia Nervosa, a challenging evaluation: analysis of a sample of customers from organic food stores

Title

Orthorexia Nervosa, a challenging evaluation: analysis of a sample of customers from Organic Food Stores.

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Abstract

An excessive control of quality of food can turn into Orthorexia Nervosa (ON). The organic store customers (OSCs) can be a population at risk of developing ON. Main objectives of this study were to assess ON symptoms prevalence among them, make a comparison with non-OSCs and investigate potential predictors of ON. For this purpose, a cross-sectional survey was carried among 121 OSCs and 119 non-OSCs. The questionnaire comprehended questions assessing socio-demographic characteristics and others investigating current dietary habits. A two-tailed $p<0.05$ was considered significant. The main outcome measures used were ORTO-15 and Eating Habits Questionnaire (EHQ). Chi-squared analyses were performed to assess differences between groups (OSCs and non-OSCs). Logistic and linear regressions were performed to evaluate potential predictors of ON symptoms and to compare questionnaires. As main results, OSCs had a higher probability to result positive at ORTO-15 compared to non-OSCs, both with 40 and 35 cut-off ($p=0.009$, $p=0.004$). The positivity at ORTO-15 among OSCs was 69.4% and 23.1% (40 and 35 cut-off). Lower ORTO-15 and higher EHQ scores were reported among OSCs ($p<0.001$). Potential predictors were mainly being an OSC or following food restrictions. Predictors varied using different cut-off of ORTO-15 and EHQ. These results suggest association between OSCs and ON symptoms. Some differences were found between ORTO-15 and EHQ. Further studies need to be performed to improve diagnostic tools.

Key Words

Eating Disorder; Food, Organic; Healthy Diet; Diet, Vegetarian

Introduction

Orthorexia Nervosa (ON) represents an emerging condition. People with ON symptoms transform a careful approach to nutrition into an obsession, indeed their attention to a healthy and balanced diet may lead to risky food restrictions and eating disorders (Costa, Hardan-Khalil, & Gibbs, 2017). Firstly described by Bratman in 1997 (Bratman, 1997), ON is mostly defined by these criteria: obsessional/pathological preoccupation with healthy diet; emotional repercussions of non-adherence to self-imposed rules; psychosocial damages in relevant areas of life along with malnutrition and weight loss (Cena et al, 2019). One of the main characteristics is abstaining from eating food treated with chemicals, artificial substances, or important fat amounts, salt or sugar (Moroze, Dunn, Craig Holland, Yager, & Weintraub, 2015). Although ON has already been reported, no enough data exist to declare ON an official eating disorder to be included in the latest *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) (Fairburn & Cooper, 2011; Varga, Thege, Dukay-Szabó, Túry, & van Furth, 2014).

Different studies tried to assess ON prevalence giving a broad variety of results, from 6.9% to 57.6% in general population (Donini, Marsili, Graziani, Imbriale, & Cannella, 2004; Ramacciotti et al., 2011), reaching 86% in high-risk populations (Herranz Valera, Acuña Ruiz, Romero Valdespino, & Visioli, 2014). Since no diagnostic criteria exist, the wide variety of tools could explain such different findings. Presently, the most used scale is the ORTO-15, which has several translations available (Arusoğlu, Kabakçi, Köksal, & Merdol, 2008; Asil & Sürücüoğlu, 2015; Bağci Bosi et al., 2007; Barcelos Pontes & Montagner, 2014; Brytek-Matera, Krupa, Poggiogalle, & Donini, 2014; Missbach et al., 2015; Stochel et al., 2015; Varga et al., 2014). Moreover, to analyse awareness, behaviours and perceptions connected to excessive attention for healthy eating, the Eating Habits Questionnaire (EHQ) was created (Bert et al., 2019; Brytek-Matera, Czepczor-Bernat, Jurzak, Kornacka, &

Kołodziejczyk, 2019; Gleaves, C. Graham, & Ambwani, 2013).

This study evaluated the organic store customers (OSCs) population, which might be at risk. Indeed, according to recent ON definitions, the suitable food is mainly described as healthy/proper/correct, organic and biologically pure (Cena, 2019). Although a U.S. study reported that people engaged with alternative food network (including organic shops) were more prone to ON tendencies (Barnett, Dripps, Blomquist, 2016), few literature about OSCs exists. Additionally, recent Italian data revealed that organic food consumption has increased since 2010 and OSCs showed an interest in healthy and sustainable food (Sistema d'Informazione Nazionale sull'Agricoltura Biologica, 2017). Therefore, we aimed to assess ON symptoms prevalence among OSCs, compared to non-OSCs, and explore possible ON symptoms predictors considering potential well-documented confounders, e.g. vegetarian diet (Brytek-Matera, 2019). To our knowledge, no other study assessed the risk of developing ON in this specific population in the Italian context or in similar realities.

Materials and Methods

A cross-sectional survey was conducted in Northern Italy (Piedmont) between January and June 2018. The Internal Review Board of the Department of Public Health Sciences (University of Torino) approved the protocol. The main inclusion criterion was deciding personally for own nutrition habits (e.g. excluded students living with parents), the exclusion criteria were being underage or not able to understand the questionnaire. The researchers collected the questionnaires at the entrance of organic stores and non-organic stores (e.g. supermarkets) through convenience sampling, ensured anonymity and, before the administration, explained the aims of the study. Informed consents were obtained. Participation was voluntary and without compensation. Collected questionnaires were 245, 5 (2%) were excluded because ORTO-15 or EHQ were not properly filled leading to a final sample of 121 OSCs and 119 non-OSCs.

The 47-item questionnaire was developed considering ON studies and was validated by a pilot study on 10 subjects. Items 1 to 11 investigated socio-demographic and health-related characteristics. Body Mass Index (BMI) was categorized in WHO classes (WHO - World Health Organization, n.d.). Some items assessed: food allergy/intolerance, persons who diagnosed allergy/intolerance (then categorized in specialists and non-specialists) and specific eating habits. Eating habits were grouped according to frequencies in our sample: No food restriction, Vegetarian diet, Vegan diet, Healthy diet (i.e. diet with the purpose of a better health), Other (e.g. gluten-free, lactose-free, meat-free).

Items from 12 to 26 were the ORTO-15 (Arusoğlu et al., 2008; Asil & Sürücüoğlu, 2015; Bağci Bosi et al., 2007; Barcelos Pontes et al., 2014; Brytek-Matera et al., 2014; Missbach et al., 2015; Stochel et al., 2015; Varga et al., 2014). The sum of each item (score from 1 to 4) gives the ORTO-15 score, from 15 to 60. Several cut-offs exist and none is widely accepted as standard, although the 40 and 35 cut-offs are the most employed (Donini et al., 2004; Donini, Marsili, Graziani, Imbriale, & Cannella, 2005). Scores below the cut-off indicate ON symptoms presence. As ORTO-15 was criticized for low specificity (Dell'Osso et al., 2016; Ramacciotti et al., 2011), we added the EHQ, a 21-item tool that showed good performances (Bert et al., 2019; Gleaves et al., 2013). Each item has a score from 1 to 4. The final score ranges from 21 to 84. ON symptoms probability rises with higher EHQ scores, but a widely accepted cut-off is not available. We refer to previous studies for in depth discussion on the questionnaire used.

Descriptive analyses, chi-squared and Mann–Whitney U tests to compare OSCs and non-OSCs were conducted. Continuous variables had non-normal distributions (Shapiro-Wilk test).

ORTO-15 and EHQ scores were analyzed as continuous. Then, ORTO-15 most common cut-offs (40 and 35) delineated ON symptoms positive and negative groups. Univariable and

multivariable models were performed to explore predictors, using linear (EHQ score, ORTO-15 score) or logistic (ORTO-15 positive/negative) regression. Covariates were included using the ENTER method.

Analyses were performed using SPSS® (v25) and a two-tailed p-value<0.05 as significant.

Results

Females were 68.8% and median age was 44 (IQR=23). ORTO-15 median score was 38 (IQR=5), 61.3% scored below 40 while 16.3% below 35. EHQ median score was 35 (IQR=10). The complete description is in Table 1.

Age distribution varied significantly across OSCs and non-OSCs. Chi-squared analyses showed significant differences between OSCs and non-OSCs. For instance, OSCs were more frequently employed, had less frequently high education level, reported a higher frequency of food allergy diagnosed by non-specialists and were more likely to follow food restrictions. OSCs had a higher probability to result positive at ORTO-15 (both cut-offs). The ON symptoms prevalence among OSCs was 69.4% and 23.1% (40 and 35 cut-offs), while among non-OSCs was 52.9% and 9.2%. ORTO-15 and EHQ score distributions varied significantly across the two groups, with lower ORTO-15 and higher EHQ scores among OSCs. Data are presented in Table 1. [Table 1 near here]

Considering the ORTO-15 cut-off at 40, the multivariable logistic regression showed as risk factors for ON symptoms: being an OSC and following food restrictions other than vegetarian, vegan and healthy diet. Females had a lower probability of ON symptoms. Data are presented in Table 2. [Table 2 near here]

Differently, the multivariable model with the cut-off at 35 showed only following vegetarian diet as a risk factor. Being an OSC resulted a risk factor only in the univariable regression. Data are presented in Table 3. [Table 3 near here]

The multivariable linear regression showed a negative association with the ORTO-15 score for OSCs and those who followed vegan or other food restrictions. Being overweight had a positive association. Data are presented in Table 4. [Table 4 near here]

Finally, the EHQ multivariable linear regression showed a positive association with having a food allergy diagnosed by a specialist and following vegetarian or vegan diet. The univariable regression showed a positive association with being an OSC, however it was not verified by the multivariable model. Data are presented in Table 5. [Table 5 near here]

Discussion

ON is an emerging condition that has been extensively studied (Bağci Bosi et al., 2007; Brytek-Matera et al., 2014; Donini et al., 2004, 2005; Dunn & Bratman, 2016; Ramacciotti et al., 2011; Strahler, 2019; Varga et al., 2014), but much remains to be investigated.

Therefore, analyses to identify high-risk sub-groups were performed. OSCs resulted significantly associated to an increased probability to present ON symptoms. A previous study outlined how subjects consuming alternative and organic food were more prone to ON behaviour (Barnett, Dripps, Blomquist, 2016), but none assessed ON symptoms prevalence in OSCs, turning the present work in a first step to identify a possible high-risk population.

Additionally, possible predictors of ON symptoms were assessed. Having food restrictions, especially vegetarian or vegan diet, resulted a significant predictor. These results, coherent with the literature (Brytek-Matera et al., 2019; Dunn & Bratman, 2016; Herranz Valera et al., 2014), could represent a confounding, making hard to discriminate between strict eating habit and pathological condition.

In our work, females were significantly associated with a reduced probability of ON behaviour only using ORTO-15 (40 cut-off), coherently with the review published in 2019, reporting no sex differences (Strahler, 2019).

Higher BMIs were positively associated to ON symptoms. Interestingly, no association was found for low BMI. Indeed, low BMI is associated with Anorexia Nervosa (Bert et al., 2019; Oberle et al., 2017) and this could represent a difference between these two disorders.

Around a quarter declared intolerances or food allergies. Moreover, few recurred to specialists for the diagnosis with a significant difference between OSCs and non-OSCs. These data confirmed previous investigations of the Italian Ministry of Health (Ministero della Salute, 2014)

This study had some limitations, firstly the use of convenience sampling. This choice was made considering the struggle to define an a priori representative sample. We enrolled all the voluntary customers in the study period, since no prevalence data were available. Therefore, our results must be interpreted with caution as our aim was to make hypotheses that need to be verified with subsequent studies. Moreover, no data about people who refused to participate were collected causing a potential loss of information and making impossible to calculate the response rate. The tools used, despite their ease to be used, have been extensively discussed. Previous studies raised concerns on ORTO-15 reliability, considering its internal consistency (Dell'Osso et al., 2016; Ramacciotti et al., 2011, Oberle, Samaghabadi, & Hughes, 2017). Thus, the EHQ was developed, but no threshold was suggested (Bert et al., 2019; Gleaves et al., 2013, Brytek-Matera et al., 2019), making possible only to highlight a greater propensity to 'orthorexic behaviors'. This lack of tools is among the main reasons of the failure to recognize ON in the DSM-5.

Conclusions

ON is under study, but definitive evaluation and diagnostic tools have yet to be identified. The available evaluation tools are not useful in the complete description of people's behaviour towards food and a narrative approach could be a way to overcome this. Further studies are needed to confirm OSCs as a higher-risk group and develop more precise

evaluation tools.

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Declaration of Interest Statement

The Authors declare that no funding or grants were received from other organizations for the conduction of this study. The Authors declare that they have no conflict of interest.

Data availability statement

The data that support the findings of this study are available from the corresponding author, BF, upon reasonable request.

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Table 1

Characteristics of the sample stratified by Organic Store utilization.

Characteristic		Overall N (%) (n=240)	OSC		p
			No (n=119)	Yes (n=121)	
Gender	*Male*	75 (31.3)	44 (58.7)	31 (41.3)	.058*
	Female	165 (68.8)	75 (45.5)	90 (54.5)	
Age		44 (23)	37 (24)	47 (20)	**.001****
BMI	*Underweight*	20 (8.3)	7 (35)	13 (65)	.146*
	Normal	165 (68.8)	79 (47.9)	86 (52.1)	
	Overweight	38 (15.8)	21 (55.3)	17 (44.7)	
	Obese	17 (7.1)	12 (70.6)	5 (29.4)	
Employment status	*Unemployed*	40 (17.0)	28 (70)[a]	12 (30)[b]	**.004***
	Employed	195 (83.0)	88 (45.1)[b]	107 (54.9)[a]	
Education level	*Middle School*	11 (4.6)	4 (36.4)	7 (63.6)	**<.001***
	High School	87 (36.3)	29 (33.3)[b]	58 (66.7)[a]	
	University degree or higher	142 (59.2)	86 (60.6)[a]	56 (39.4)[b]	
Food Allergy	*No*	181 (75.7)	93 (51.4)	88 (48.6)	**.012***
	Yes, diagnosed by a specialist	25 (10.5)	16 (64)	9 (36)	
	Yes, diagnosed by other health professional (or self-diagnosed)	33 (13.8)	9 (27.3)[b]	24 (72.7)[a]	
Food restriction	*None*	160 (66.7)	102 (63.7)[a]	58 (47.9)[b]	**<.001***
	Vegetarian	22 (9.2)	3 (13.6)[b]	19 (86.4)[a]	
	Vegan	16 (6.7)	1 (6.3)[b]	15 (93.8)[a]	
	Healthy Diet	14 (5.8)	2 (14.3)[b]	12 (85.7)[a]	
	Other	28 (11.7)	11 (39.3)	17 (60.7)	
Perceived Health Status	*Poor*	64 (26.9)	35 (54.7)	29 (45.3)	.301*
	Good	174 (73.1)	82 (47.1)	92 (52.9)	
ORTO-15 (linear)		38 (5)	39 (4)	37 (5)	**<.001****
ORTO-15 (40 cut-off)	*Negative*	93 (38.8)	56 (60.2)[a]	37 (39.8)[b]	**.009***
	Positive	147 (61.3)	63 (42.9)[b]	84 (57.1)[a]	
ORTO-15 (35 cut-off)	*Negative*	201 (83.8)	108 (53.7)[a]	93 (46.3)[b]	**.004***
	Positive	39 (16.3)	11 (28.2)[b]	28 (71.8)[a]	
EHQ		35 (10)	33 (9)	37 (10)	**<.001****

Figures are median (IQR) or number (row %).

* Obtained via Chi-Squared test

**Obtained via Mann–Whitney U test

[a] adjusted residual >1.96

[b] adjusted residual < -1.96

BMI: Body Mass Index; EHQ: Eating Habits Questionnaire

Table 2

Predictors of Orthorexia Nervosa symptoms using ORTO-15 scale with the cut-off at 40, logistic regression analysis.

		Univariable				Multivariable			
		OR	**CI 95%**		***p***	**OR**	**CI 95%**		***p***
OSC		2.02	1.20	3.42	**.009**	2.11	1.06	4.21	**.034**
Age		.99	.98	1.01	.586	.99	.96	1.01	.272
Female		.71	.40	1.26	.246	.49	.25	.95	**.034**
BMI	*Normal*	*Ref*	-	-	-	*Ref*	-	-	-
(Body	*Underweight*	1.81	.63	5.21	.274	2.06	.61	7.01	.246
Mass	*Overweight*	.49	.24	.99	**.048**	.48	.21	1.11	.087
Index)	*Obese*	1.45	.49	4.30	.508	1.75	.53	5.82	.358
Unemployed		1.79	.90	3.54	.097	1.18	.52	2.65	.692
Education	*Middle School*	*Ref*	-	-	-	*Ref*	-	-	-
level	*High School*	.56	.14	2.25	.411	.38	.08	1.85	.233
	University degree or higher	.59	.15	2.33	.455	.52	.11	2.52	.419
Food	*No*	*Ref*	-	-	-	*Ref*	-	-	-
Allergy	*Yes, diagnosed by a specialist*	.86	.37	2.00	.727	.57	.21	1.54	.268
	Yes, diagnosed by other health professional (or self-diagnosed)	1.80	.79	4.10	.160	1.22	.48	3.07	.674
Food	*None*	*Ref*	-	-	-	*Ref*	-	-	-
restrictio	*Vegetarian*	1.47	.58	3.70	.414	1.10	.39	3.15	.854
n	*Vegan*	2.52	.78	8.140	.123	3.23	.79	13.29	.104
	Healthy Diet	2.10	.63	6.97	.226	1.71	.47	6.24	.421
	Other	5.03	1.67	15.17	**.004**	4.45	1.38	14.37	**.012**
Good perceived health status		.69	.38	1.26	.231	.55	.25	1.19	.127

Table 3

Predictors of Orthorexia Nervosa symptoms using ORTO-15 scale with the cut-off at 35, logistic regression analysis.

		Univariable				Multivariable			
		OR	**CI 95%**		***p***	**OR**	**CI 95%**		***p***
OSC		2.96	1.40	6.26	**.005**	2.33	.87	6.24	.092
Age		1.01	.99	1.04	.283	1.01	.97	1.04	.580
Female		1.19	.56	2.54	.654	.78	.32	1.93	.593
BMI	*Normal*	*Ref*	-	-	-	*Ref*	-	-	-
(Body	*Underweight*	2.29	.81	6.51	.120	2.37	.72	7.79	.156
Mass	*Overweight*	.63	.21	1.92	.416	.78	.23	2.60	.683
Index)	*Obese*	1.15	.31	4.27	.839	1.33	.31	5.76	.703
Unemployed		1.48	.54	4.05	.447	1.08	.34	3.45	.901
Education	*Middle School*	*Ref*	-	-	-	*Ref*	-	-	-
level	*High School*	1.01	.20	5.15	.987	1.19	.19	7.41	.854
	University degree or higher	.78	.16	3.87	.762	1.39	.22	8.64	.723
Food	*No*	*Ref*	-	-	-	*Ref*	-	-	-
Allergy	*Yes. diagnosed by a specialist*	2.43	.92	6.40	.073	2.76	.89	8.56	.078
	Yes. diagnosed by other health professional (or self-diagnosed)	1.68	.66	4.28	.277	1.36	.48	3.86	.563
Food	*None*	*Ref*	-	-	-	*Ref*	-	-	-
restriction	*Vegetarian*	3.93	1.40	10.98	**.009**	3.40	1.08	10.70	**.036**
	Vegan	3.82	1.19	12.33	**.025**	3.54	.92	13.65	.067
	Healthy Diet	2.29	.58	9.05	.236	1.68	.37	7.51	.501
	Other	2.80	1.04	7.56	**.042**	1.96	.66	5.84	.230
Good perceived health status		.76	.36	1.62	.478	.70	.27	1.81	.462

Table 4

Predictors of Orthorexia Nervosa symptoms using ORTO-15 scale, linear regression analysis.

		Univariable				Multivariable			
		Beta	**CI 95%**		***p***	**Beta**	**CI 95%**		***p***
OSC		-1.98	-2.80	-1.17	**<.001**	-1.77	-2.72	-.81	**<.001**
Age		.01	-.02	.04	.563	.02	-.02	.05	.270
Female		.05	-.87	.97	.920	.68	-.21	1.58	.133
BMI	*Normal*	*Ref*	-	-	-	*Ref*	-	-	-
(Body	*Underweight*	-1.16	-2.83	.52	.175	-.50	-2.13	1.13	.544
Mass	*Overweight*	1.99	.83	3.15	**.001**	1.79	.62	2.97	**.003**
Index)	*Obese*	-.36	-2.10	1.37	.682	-.65	-2.32	1.01	.441
Unemployed		-1.53	-2.70	-.35	**.011**	-.34	-1.51	.84	.576
Education	*Middle School*	*Ref*	-	-	-	*Ref*	-	-	-
level	*High School*	.25	-.65	1.14	.592	2.13	-.29	4.55	.085
	University degree or higher	-.10	-.98	.78	.822	1.47	-.96	3.91	.235
Food	*No*	*Ref*	-	-	-	*Ref*	-	-	-
Allergy	*Yes. diagnosed by a specialist*	.13	-1.32	1.57	.861	.17	-1.28	1.52	.871
	Yes. diagnosed by other health professional (or self-diagnosed)	-.79	-2.04	.46	.213	-.18	-1.41	1.05	.777
Food	*None*	*Ref*	-	-	-	*Ref*	-	-	-
restriction	*Vegetarian*	-1.20	-2.70	.30	.116	-.93	-2.43	.58	.227
	Vegan	-2.16	-3.93	-.38	**.017**	-1.94	-3.72	-.17	**.032**
	Healthy Diet	-.61	-2.47	1.25	.520	-.73	-2.55	1.10	.434
	Other	-1.99	-3.40	-.57	**.006**	-1.88	-3.28	-.48	**.009**
Good perceived health status		-.26	-1.27	.75	.608	.15	-.91	1.21	.784

Table 5

Predictors of Orthorexia Nervosa symptoms using Eating Habits Questionnaire (EHQ), linear regression analysis.

		Univariable				Multivariable			
		Beta	**CI 95%**		***p***	**Beta**	**CI 95%**		***p***
OSC		2.90	1.29	4.51	**<.001**	.84	-1.02	2.69	.374
Age		.04	-.02	.10	.203	.02	-.04	.09	.490
Female		1.36	-.41	3.14	.131	-.24	-1.94	1.46	.782
BMI	*Normal*	*Ref*	-	-	-	*Ref*	-	-	-
(Body	*Underweight*	2.68	-.39	5.75	.087	1.60	-1.33	4.52	.282
Mass	*Overweight*	-1.00	-3.21	1.20	.371	-.37	-2.54	1.79	.735
Index)	*Obese*	1.91	-1.47	5.28	.266	2.63	-.54	5.81	.104
Unemployed		1.49	-.71	3.69	.183	1.35	-.80	3.50	.217
Education	*Middle School*	*Ref*	-	-	-	*Ref*	-	-	-
level	*High School*	1.21	-.50	2.92	.164	-1.67	-5.59	2.26	.403
	University degree or higher	-1.76	-3.42	-.09	**.039**	-2.36	-6.28	1.57	.238
Food	*No*	*Ref*	-	-	-	*Ref*	-	-	-
Allergy	*Yes. diagnosed by a specialist*	4.40	1.65	7.14	**.002**	5.01	2.34	7.68	**<.001**
	Yes. diagnosed by other health professional (or self-diagnosed)	1.43	-.94	3.80	.235	1.03	-1.26	3.32	.375
Food	*None*	*Ref*	-	-	-	*Ref*	-	-	-
restriction	*Vegetarian*	3.13	.36	5.91	**.027**	3.55	.80	6.30	**.012**
	Vegan	8.15	4.82	11.47	**<.001**	8.78	5.34	12.21	**<.001**
	Healthy Diet	.46	-3.04	3.96	.796	.93	-2.47	4.33	.589
	Other	2.27	-.36	4.90	.090	1.94	-.62	4.50	.137
Good perceived health status		-1.09	-2.94	.76	.248	-.68	-2.61	1.26	.492